

12.6

Surface Area and Volume of Spheres

- Goals**
- Find the surface area of a sphere.
 - Find the volume of a sphere.

VOCABULARY

Sphere

Radius of a sphere

Chord of a sphere

Diameter of a sphere

Great circle

Hemisphere

THEOREM 12.11: SURFACE AREA OF A SPHERE

The surface area S of a sphere with radius r is $S = \underline{\hspace{2cm}}$.

Example 1**Finding the Surface Area of a Sphere**

Find the surface area. When the radius doubles, does the surface area double?

**Solution**

a. $S = 4\pi r^2 = 4\pi(\underline{\quad})^2 = \underline{\quad}\pi \text{ cm}^2$

b. $S = 4\pi r^2 = 4\pi(\underline{\quad})^2 = \underline{\quad}\pi \text{ cm}^2$

The surface area of the sphere in part (b) is times greater than the surface area of the sphere in part (a) because $\underline{\quad}\pi \cdot \underline{\quad} = \underline{\quad}\pi$.

Answer When the radius of a sphere doubles, the surface area .

Example 2**Using a Great Circle**

The circumference of a great circle of a sphere is 7.4π feet. What is the surface area of the sphere?

Solution

Begin by finding the radius of the sphere.

$C = 2\pi r$ **Formula for circumference of circle**

$\underline{\quad} = 2\pi r$ **Substitute for C.**

$\underline{\quad} = r$ **Divide each side by 2π .**

Using a radius of feet, the surface area is

$S = 4\pi r^2 = 4\pi(\underline{\quad})^2 = \underline{\quad}\pi \text{ ft}^2$.

Answer The surface area of the sphere is $\pi \text{ ft}^2$, or about ft^2 .

THEOREM 12.12: VOLUME OF A SPHERE

The volume V of a sphere with radius r is $V = \underline{\quad}$.

Example 3**Finding the Volume of a Sphere**

What is the radius of a sphere made from the cylinder of modeling clay shown? Assume the sphere has the same volume as the cylinder.

Solution

To find the volume of the cylinder of modeling clay, use the formula for the volume of a cylinder.

$$V = \pi r^2 h = \pi(\underline{\hspace{1cm}})^2(\underline{\hspace{1cm}}) = \underline{\hspace{1cm}} \pi \text{ cm}^3$$

To find the radius of the sphere, use the formula for the volume of a sphere and solve for r .

$$V = \frac{4}{3}\pi r^3 \quad \text{Formula for volume of sphere}$$

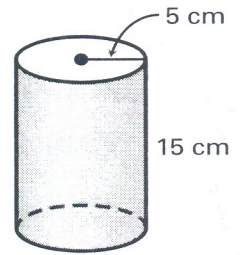
$$\underline{\hspace{1cm}} \pi = \frac{4}{3}\pi r^3 \quad \text{Substitute for } V.$$

$$\underline{\hspace{1cm}} \pi = 4\pi r^3 \quad \text{Multiply each side by } \underline{\hspace{1cm}}.$$

$$\underline{\hspace{1cm}} = r^3 \quad \text{Divide each side by } \underline{\hspace{1cm}}.$$

$$\underline{\hspace{1cm}} \approx r \quad \text{Use a calculator to take the cube root.}$$

Answer The radius of the sphere is about $\underline{\hspace{1cm}}$ centimeters.

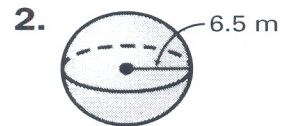


Cylinder of modeling clay



Sphere made from cylinder of modeling clay

✓ **Checkpoint** Find the surface area and volume of the sphere. Round your results to two decimal places.



Study Guide

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Spheres

The following is a list of definitions related to the study of spheres.

Sphere	the set of all points that are a given distance from a given point (center)
Radius	a segment whose endpoints are the center of the sphere and a point on the sphere
Chord	a segment whose endpoints are points on the sphere
Diameter	a chord that contains the sphere's center
Tangent	a line that intersects the sphere in exactly one point
Hemispheres	two congruent halves of a sphere separated by a great circle

THEOREM 12.11: SURFACE AREA OF A SPHERE

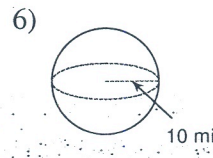
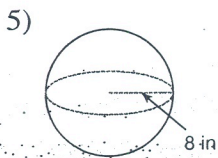
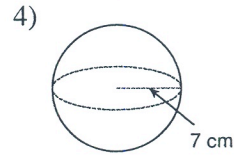
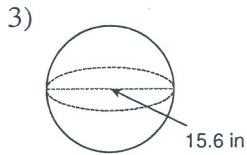
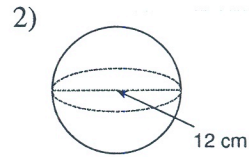
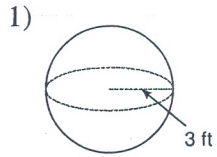
The surface area S of a sphere with radius r is $S = \underline{\hspace{2cm}}$.

THEOREM 12.12: VOLUME OF A SPHERE

The volume V of a sphere with radius r is $V = \underline{\hspace{2cm}}$.

Spheres

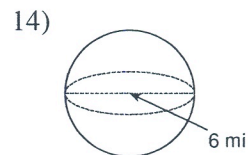
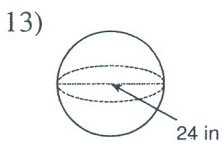
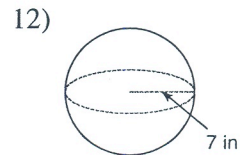
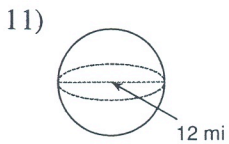
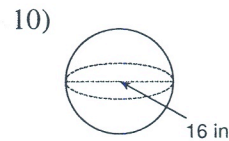
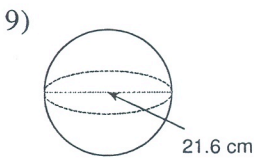
Find the surface area of each figure. Round your answers to the nearest tenth, if necessary.



7) A sphere with a diameter of 6.2 in.

8) A sphere with a radius of 10 mi.

Find the volume of each figure. Round your answers to the nearest tenth, if necessary.



15) A sphere with a diameter of 2 m.

16) A sphere with a diameter of 10 ft.

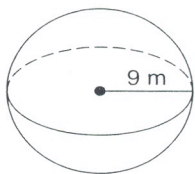


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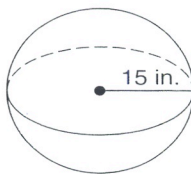
Spheres

Find the surface area and volume of each sphere. Round to the nearest hundredth.

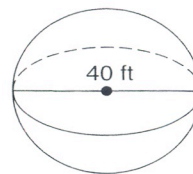
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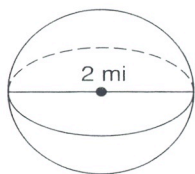
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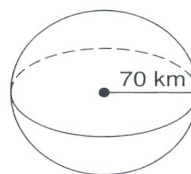
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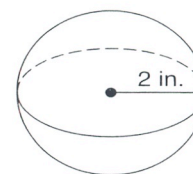
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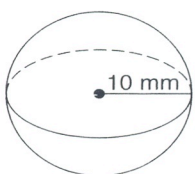
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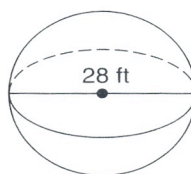
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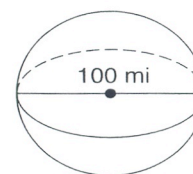
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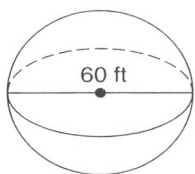
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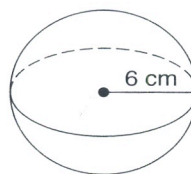
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10.



11.



12.

